Supplemental Reference Marker (SRM) Information

Cleveland/Lorain ITS Early Deployment Planning Study

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submitted to
Ohio Department of Transportation
District 12

by
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1. INTRODUCTION

A comprehensive Intelligent Transportation Systems (ITS) Early Deployment planning study was recently completed that identified where and how ITS technologies and methodologies could best be applied to improve the safety, efficiency, and capacity of the greater Cleveland/Lorain regional transportation network. As such, this study's final report, known as a *Strategic Deployment Plan* , recommended a series of phased actions for achieving these above goals. For example, the following items were identified for "Immediate Action":

- Continue "Road Crewzer" service patrols, and expand/adjust routes;
- Implement an education program for cellular telephone incident reporting;
- Appoint an Incident Management Task Force;
- Pursue legislative actions to eliminate legal barriers to the pushing and towing of disabled vehicles, and the efficient removal of spilled cargo;
- Plan diversion routes;
- Enhance the accuracy and timeliness of media reporting of traffic conditions;
- Purchase portable changeable message signs for use during major incidents;
- Conduct a site location study for highway advisory radio (HAR); and
- Install more closely-spaced reference markers to help callers report incidents and help response personnel locate incidents.

To more effectively achieve the anticipated results of these above deployment recommendations, the Ohio Department of Transportation commissioned a series of reports to guide the implementation of each such immediate action item. This document is one of those commissioned reports. More specifically, it is provided to answer relevant questions regarding the deployment of more closely-spaced reference markers for helping callers report incidents and for helping response personnel locate incidents.

2. PROBLEM STATEMENT

One of the most frequent causes of delay in responding to incidents results from the inability of motorists to accurately communicate an exact location for a particular incident. For example, unless an incident happens to occur within sight of a major landmark, or happens to occur next to one of the existing interstate reference markers that are spaced at one mile intervals, drivers will not know their exact location. A serious consequence of this is that without accurate location information, emergency response dispatchers may not know the proper jurisdiction that should be dispatched to the scene of an incident. This can be especially problematic in urban areas where a roadway may pass through multiple jurisdictions within a relatively short distance. In these cases, location uncertainty can necessitate that emergency dispatchers send response teams from more than one

jurisdiction to a supposed incident site; a practice that wastes limited emergency personnel and equipment resources.

A second shortcoming of the currently-deployed interstate mile markers are that they do not identify travel direction or the route number that is being traversed. This can be especially problematic in metropolitan areas such as Cleveland where multiple route numbers may converge to share the same physical roadway pavement, and then re-diverge onto different physical roadway pavements within a relatively short distance. Thus, unless a motorist is very familiar with an area, it is quite possible that an incident notification call could include an erroneous route number and/or travel direction, in addition to an uncertain or unknown milepoint location.

3. SOLUTION

In response to these above needs for a more accurate way to determine incident locations, the Cleveland/Lorain ITS Early Deployment Planning Study recommends as an immediate action item the installation of supplemental reference markers (see Figure 1) throughout the entire length of this study's proposed "Initial Deployment" corridors (see Table 1). More specifically, this study recommends that these supplemental reference markers be placed at either 1/10th mile or 1/5th mile spacing along the freeway mainlines of these corridors (see Figure 2), and at appropriate spacings along all associated ramps (see Figure 3). The following provides additional descriptions of these signs, which have already been installed throughout much of Metropolitan Cincinnati / Northern Kentucky as part of the ARTIMIS project (Advanced Regional Traffic Interactive Management Information System), and which will soon be installed throughout portions of Louisville, Kentucky as part of a similar project.

Figure 1. Typical Supplemental Reference Marker

Table 1. Recommended Initial Deployment for a Cleveland/Lorain I.T.S.

ROUTE	FROM	TO	DISTANCE (miles)
I-71	US-42	Route end at I-90	13.6
I-77	I-480	Route end at I-90	5.8
I-90	Woodward Avenue	SR-175	19.3
I-480	0.3 mi. W of I-77	Warrensville Center Rd.	6.3
US-42	Drake Road	Route end at Public Square	17.9
		TOTAL:	62.9

NOTE: Reference marker "Zero" shall be placed at the same station as the corresponding Mile Marker.

Figure 2. Typical Mainline Reference Marker Installation

3.1 Sign Descriptions

As illustrated in Figure 4, ramp-type supplemental reference markers are 30" (thirty) inches wide by 30" (thirty) inches high, and consist of four lines of white on blue Series "C" text. When used along exit ramps, the sign's first line indicates the word "RAMP", the second line indicates the route designation(s) of the freeway being exited, the third line indicates the word "TO", and the fourth line indicates a seven-character abbreviation for the intersecting surface roadway at the ramp's terminus. When used along entrance ramps, the sign's first line indicates the word "RAMP", the second line indicates a seven-character abbreviation for the intersecting surface roadway that one is entering from, the third line indicates the word "TO", and the fourth line indicates the route designation(s) of the freeway at the ramp's terminus.

NOTE 1: Ramp markers shall be placed equally spaced. Spacing should be equal to or greater than 350' and less than or equal to 550' (350' <= x <= 550'). When possible, there

should be 500’ between the beginning of the ramp and the first ramp marker, as well as the end of the ramp and the last ramp marker. Any ramp less than 1050’ shall only have one ramp marker placed in the center of the ramp. Adjustments may be made for bridges or other obstructions.

NOTE 2: Final adjustments and determination of need shall be at the discretion of the Engineer.

Figure 3. Typical Ramp Reference Marker Installations

Figure 4. Typical Ramp-Type Reference Marker

As illustrated in Figure 5, mainline-type supplemental reference markers are usually 14" (fourteen) inches wide by 48" (forty-eight) inches high, and consist of four lines of white on blue Series "C" text. The sign's first line indicates the travel direction, the second line indicates the route designation via the use of a shield-type graphic (if applicable), the third line indicates the associated mile marker segment, and the fourth line indicates the 1/10th mile increment as per the sign's location. It should be noted that in portions of Kentucky where milepoints greater than 99 (ninety-nine) and/or route-sharing exists, the dimensions of mainline-type supplemental reference markers have been increased to 24" (twenty-four) inches wide by 48" (inches) high such that they can fit three-digit milepoints and/or dual shield-type graphics (see Figure 6).

3.2 Sign Placement / Mounting

Supplemental reference markers are mounted at a height of four feet above the nearest roadway edge and are located on poles installed within a freeway's inner median (for mainline marker installations), and next to the outside shoulder of a ramp (for ramp marker installations). Specifications used for ARTIMIS-related installations also provided the following four additional guidelines for median installations:

Notes:
(1) Divider line thickness = 1/2”
(2) Divider line length = Width of the numbers above the line

Figure 5. Typical Mainline-Type Reference Marker (Standard Size)

Notes:
(1) Divider line thickness = 1/2”
(2) Divider line length = Width of the numbers above the line

Figure 6. Typical Mainline-Type Reference Marker (Wide Size)

1. As illustrated in Figure 7a, if a median consists of a single concrete barrier, supplemental reference markers for both directions of travel shall be mounted back-to-back on a shared pole to be located on the concrete barrier wall.
2. As illustrated in Figure 7b, if a median consists of a double concrete barrier, supplemental reference markers for each direction of travel shall be individually mounted on separate poles to be located on each concrete barrier wall.
3. As illustrated in Figure 7c, if a median does not contain a concrete barrier and instead consists of a grass or paved area that is up to 60' (sixty) feet wide, supplemental reference markers for both directions of travel shall be mounted back-to-back on a shared pole to be located in the center of the median.
4. As illustrated in Figure 7d, if a median does not contain a concrete barrier and instead consists of a grass or paved area that is greater than 60' (sixty) feet wide, supplemental reference markers for each direction of travel shall be individually mounted on separate poles to be located in the median at an appropriate distance from the inside shoulder.

Finally, an additional guideline was provided such that if a light pole already exists in the median where a supplemental reference markers is to be installed, and if said light pole is within 50' (fifty) feet of the marker's true location, then the marker should be mounted to the existing light pole instead of being mounted to a separate new sign pole.

4. DISCUSSION

The following subsections discuss evaluation/reaction-type issues associated with current installations of supplemental reference markers, and lessons learned/recommendation-type issues that may be of benefit to those planning future implementations of these markers.

4.1 Public Reaction

Appendix A contains newspaper clippings of all items that have appeared in The Cincinnati Enquirer regarding the supplemental reference markers installed as part of the ARTIMIS project in Metropolitan Cincinnati / Northern Kentucky. The first item, dated June 20, 1996, is an article that provides an overview of the purpose, cost, and anticipated benefits of these markers. The second item, dated June 24, 1996, is a letter to the editor that questions the necessity of these markers. The third item, dated July 18, 1996, is an Enquirer Editorial that endorses these markers and provides examples of the enthusiasm that exists among the emergency services community for continued marker installations on additional routes. It should also be mentioned that since only one letter to the editor expressed a dissatisfaction with the markers, and that since these types of letters tend to not be written when one is satisfied with a product, the lack of a significant number of negative letters can be inferred as a preliminary general public endorsement of the markers.

4.2 Ohio Department of Transportation (ODOT) Reaction

Appendix B is a University of Kentucky Transportation Center preliminary evaluation of the reference markers installed for the ARTIMIS project. Also included are comments from ODOT officials (supportive). More specifically, the report mentions that "...major benefits from the reference signs could be gained when they are installed on the mainline and ramps in the downtown areas ... [where] numerous ramps are typically more confusing for the driving public and will likely create more difficulty when attempting to identify a location."

(a) Single Concrete Barrier Median

(b) Double Concrete Barrier Median

(c) Median Up To 60’ (Sixty) Feet (d) Median Over 60’ (Sixty) Feet

Figure 7. Guidelines For Median Installations of Supplemental Reference Markers

This above-referenced report that contains the ODOT comments also includes additional positive comments as received from two police/fire departments, two emergency/traffic communications offices, and two road service/towing companies. It is interesting to note that the road service/towing companies that were interviewed also feel that the "...greatest need for improved location identification was on ramps." As such, their comments include support for the continued installation of these supplemental reference markers on additional routes.

4.3 Longitudinal Spacing Issues

Most people interviewed agree that the ARTIMIS project's 1/10th mile longitudinal spacing of the supplemental reference markers is not "overkill" and does not contribute to excessive sign clutter and/or other negative aesthetics, especially in areas where the markers are placed back-to-back on a single concrete barrier median (see Figure 7a). However, as part of the University of Kentucky Transportation Center's two-year study to evaluate the effectiveness of these signs such that they may become a national standard, markers that are to be installed in Louisville, Kentucky as part their freeway management system will be placed at 2/10th mile spacing to evaluate if there is any loss in effectiveness. Since the overall objective is to install a sufficient number of markers to insure visibility of one sign at all points, it has been hypothesized that a possible optimum solution could be to locate markers at one-tenth mile intervals on curves, and two-tenths mile intervals on tangent sections. However, it has also been cautioned that this type of hybrid spacing may violate driver expectations of where these supplemental reference markers should be located. Thus, potentially reducing their effectiveness.

4.4 Lateral Placement Issues

Two distinct, but interrelated lateral placement issues have been identified regarding the installation of supplemental reference markers. These issues, which are related to aesthetics and vegetation control, are discussed below.

4.4.1 Aesthetics

Supplemental reference markers were originally installed based upon the following specification:

- "If a median does not contain a concrete barrier and instead consists of a grass or paved area that is greater than 30' (thirty) feed wide, supplemental reference markers for each direction of travel shall be individually mounted on separate poles to be located in the median at an appropriate distance from the inside shoulder."

However, it has been observed that when supplemental reference markers for each direction of travel are individually mounted on separate poles in a median that does not contain a concrete barrier and that instead consists of a grass or paved area that is between 30' (thirty) feet wide and 60' (sixty) feet wide (see Figure 7d), the resulting close location of the individual poles relative to each other seems to look cluttered. Thus, to avoid these negative aesthetics, it is recommended that the minimum median width that would warrant separate poles in this situation be increased to at least 60' (sixty) feet for future installations of supplemental reference markers.

4.4.2 Vegetation Control

It has been identified as a concern that for the supplemental reference markers installed on poles in the grassy portions of a median (see Figure 7d), their lateral placement relative to the edge of a freeway shoulder is currently too close to allow a standard ODOT tractor with a single-width lawn mower attachment to be able to cut the grass around them without necessitating that a significant portion of their vehicle and attachments traverse an excessive portion of the shoulder. Thus, to avoid this interference, it is recommended that future marker installations in grassy median areas conform to the following specification from Section 2E-5 of the Ohio Manual of Uniform Traffic Control Devices:

- "Normally all signs should be (a) not closer than six feet from the edge of a paved or usable shoulder or (b) a minimum of twelve feet from the edge of the roadway pavement, whichever is greater."

As a comparison, it should be mentioned that Section 2X-9 of the Ohio Manual of Uniform Traffic Control Devices states that traditional Interstate mile markers, which are located next to the outside shoulder of a freeway, shall utilize the same minimum lateral placement as that used for delineators. However, this distance, which is specified in the Manual's Section 4B-5 as being "...(a) not closer than two feet from the edge of a paved or usable shoulder and (b) not farther than twelve feet six inches from the edge of the roadway pavement, whichever is less", is not of sufficient distance to prevent the above grass cutting interference situation. Thus, unless a specific engineer-approved situation warrants otherwise, it is still recommended that future marker installations in grassy areas conform to the above bulleted statement from the Manual's Section 2E-5.

4.5 Specification Issues

As described previously, 24" (twenty-four) inch extra-wide supplemental reference markers have been utilized along portions of Kentucky freeways where milepoints greater than 99 (ninety-nine) and/or route-sharing necessitates the extra width in order that three-digit milepoints and/or dual shield-type graphics can fit onto a single reference marker (see Figure 6). However, because the width of a single concrete barrier median is also 24" (twenty-four) inches, if an extra-wide marker is mounted on a concrete barrier median, it is quite possible that there may not be enough side clearance to safely allow emergency

vehicles to utilize an inside shoulder for travel to an incident without creating a risk that the external side mirrors of said vehicles may hit these extra-wide signs. Furthermore, it has been observed that the messages on these extra-wide signs seem to have excess margins on either side of the milepoint digits and shield-type graphics. Thus, to avoid this potential maintenance liability, it is recommended that future installations of extra-wide supplemental reference markers eliminate the excess margins and utilize 20" (twenty) inch wide signs rather than the current 24" (twenty-four) inch wide signs. This can then provide additional side clearance for shoulder-traveling emergency vehicles without requiring any corresponding decrease in the image size/legibility of any of the text and graphics messages that appear on these signs.

4.6 General Issues

Finally, since tow truck dispatchers in areas where supplemental reference markers have already been installed indicated that they do not have a handbook for cross-referencing between reference marker locations and traditional landmarks of cross streets, U-turn areas, and major buildings, etc., is recommended that this type of document be created for them. A sample page from this type of supplemental reference marker map/index document is provided in Figure 8.

5. SUMMARY / CONCLUSIONS

As has been documented in the appropriate sections of this report, future installations of supplemental reference markers should incorporate modified specifications regarding lateral spacing, longitudinal spacing, and allowable sign widths such that improved aesthetics and vegetation control can be achieved. Nevertheless, supplemental reference markers such as those that have recently been installed as part of the ARTIMIS freeway traffic management project in Metropolitan Cincinnati / Northern Kentucky have been shown to be positive additions to the location information that is available to the driving public. Area dispatchers for "911" indicate that motorists with cellular phones are already citing the new location markers when they call to report freeway emergencies; and a preliminary report by the University of Kentucky Transportation Center indicates that public- and private-sector incident/emergency response agencies support the continued deployment of these reference markers along additional routes. Thus, agencies that are considering new installations of supplemental reference markers should feel confident that their efforts/investments can achieve positive results.

Figure 8. Sample Page of a Reference Marker Map Index

6. APPENDIX A. Newspaper Articles.

7. APPENDIX B. Univ. of Kentucky Evaluation Report